Car Electronic Systems

kdFi V1.3

User Manual

You will find the latest information, documentation and CD images on

www.k-data.org

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1. Introduction

Congratulation for buying the kdFi V1.3.

The circuit of the kdFi based on Megasquirt MS2 V3.0 was enhanced for the firmware MS2extra and provided with additional circuits in order to enable simple adaptation to a great number of engine types.

A Wideband Lambda Controller (JAW) is also arranged on the PCB. The Bosch LSU 4.2 Lambda Sonde and the JAW Micro-processor have to be bought as accessories to use their functions.

In addition the serial inputs were replaced by a USB connection for ease of use.

2. Included in delivery

- kdFi V1.3 device ready for use
- Software CD
- USB cable
- User manual

3. Software

It is recommended installing the software from the starting menu of the CD before connecting the kdFi for the first time.

3.1 USB

You will find the USB driver of the FTDI company on the CD in the directory „USB“. It is the FTDI2232 Chip.

3.2 Megatune

The Megatune installation files can be found on the CD, directory “Megatune”. We recommend installing the BETA Software, as this runs very smoothly and has got large advantages compared to the Release.

If you want to use the Release version, you have to perform a firmware update using the corresponding version.

During installation the engine parameters are sampled. The best is to enter the future settings immediately for this simplifies considerably the start-up operation afterwards.

When using JAW we recommend selecting the innovative LC-1 as wideband sensor and adjusting afterwards the characteristic of the LC-1 in the software “JAW Deploy”.

The two systems are freely adjustable, that means you can in principle use any characteristic as long as it is the same in both systems (MS und JAW).

3.3 JAW

You can find the JAW Deploy installation files on the CD, directory „JAW“.

4. Connection

4.1 Cable types

Recommended cable types:

Ignition:	min 1,5 mm²
Injection:	min 1,5 mm²
VR sensor:	min 0,5 mm², shield
Sensors:	min 0,5 mm², shield
Others:	min 0,75 mm²

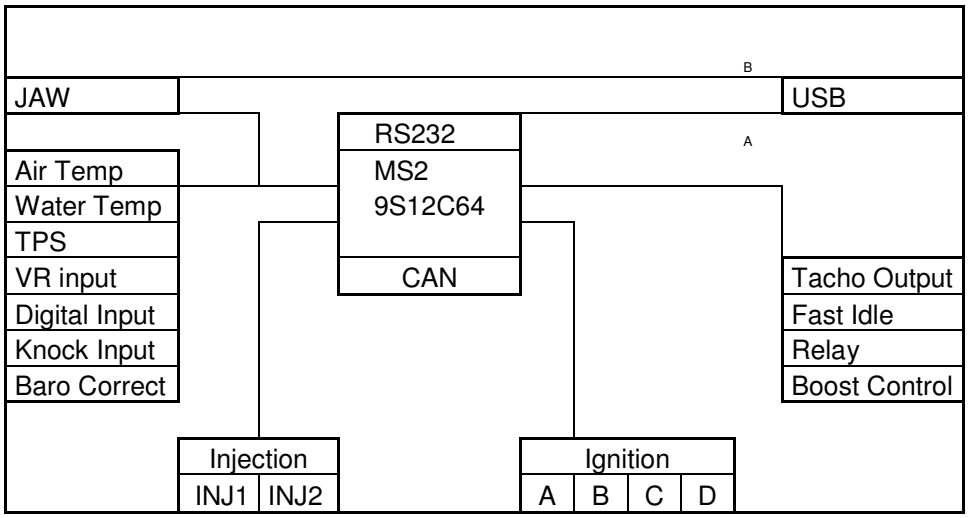
4.2 USB connection

The USB component is compatible to USB 1.1 as well as to USB 2.0. You can use each standard mini USB cable for connecting cable.

Due to the integrated USB connection two serial interfaces are available. They are displayed at the device manager of Windows. The MS2 processor is connected to the first COM Port, the JAW to the second one.

ATTENTION: The COM Ports should not exceed COM8, because this could produce communication trouble with Megatune. In this case you have to delete unused / invisible ports (incl. the kdFi Ports) from your configuration and to re-install the driver.

4.3 Schematic



4.4 Assignment

The programmable kdFi inputs / outputs are already connected to the corresponding additional circuits on the PCB.

Circuit points:

GND		Ground, available in multiple number
FP	A	Fuel pump
FDL2	A	Idle speed controller 2-pin / clocked ground connection
FDL3Z	A	Idle speed controller 3-pin – CLOSED
FDL3A	A	Idle speed controller 3-pin - OPEN
5V / GND	A	Power supply 5V (throttle potentiometer)
TPS	E	Throttle potentiometer signal
OXY	E	Lambda sensor signal
CLT / GND	E	Water temperature sensor
AIR / GND	E	Air temperature sensor
JS2	A	Boost-pressure control (waste gate)
JS5	E	Knock sensor
JS7	E	Digital input
JS10	A	Tacho output (signal for the tachometer)
JS11	A	Relay output (R0)
12V	E	Input voltage 12V
GR	JAW	Bosch LSU 4.2 : GREY
WS	JAW	Bosch LSU 4.2 : WHITE
GE	JAW	Bosch LSU 4.2 : YELLOW
SW	JAW	Bosch LSU 4.2 : BLACK
GN	JAW	Bosch LSU 4.2 : GREEN
RT	JAW	Bosch LSU 4.2 : RED
V1	JAW	Analog output V1
V2	JAW	Analog output V2
INJ1	INJ	Injection valves group 1
GND	INJ	Ground injection groups – ground separately
INJ2	INJ	Injection valves group 2
A1	IGN	Ignition output cylinder 1
A2	IGN	Ignition output parallel to cylinder 1 (wasted spark)
B1	IGN	Ignition output cylinder 2
B2	IGN	Ignition output parallel to cylinder 2 (wasted spark)
C1	IGN	Ignition output cylinder 3
C2	IGN	Ignition output parallel to cylinder 3 (wasted spark)
D1	IGN	Ignition output cylinder 4
D2	IGN	Ignition output parallel to cylinder 4 (wasted spark)
IGN_GND	IGN	Ground ignition – ground separately

Software outputs:

JS0	PT6/IAC1	Relay Output (Output JS11)
JS1		---
JS2	PT7/IAC2	Boost Control PWM Output
JS3		---
JS4		Constant Barometric Correction
JS5	PA0	Knock Input
JS6		CAN High
JS7		Digital Input (Launch Control / VE Table Switch)
JS8		CAN Low
JS10		Tacho Output
JS11		Spark Output D / Relay Output
D14		Spark Output A
D15		Spark Output B
D16		Spark Output C

4.5 Test pins

Pin assignment:

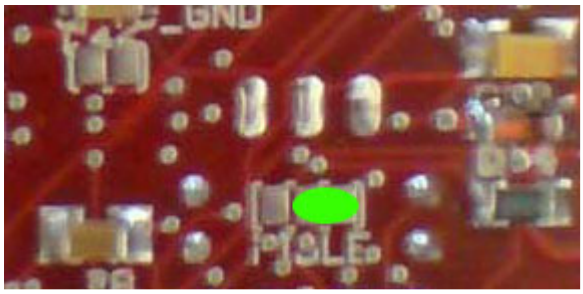
FP	36		35	USB P1
(Relay Output)	34		33	USB P2
INJ2	32		31	USB P3
INJ2	30		29	USB GND
INJ1	28		27	GND
INJ1	26		25	GND
JS11	24		23	GND
FDL2	22		21	GND
JS2	20		19	GND
+12V	18		17	GND
FDL3A	16		15	GND
TPS +5V	14		13	GND
FDL3Z	12		11	P6
RPM IN	10		9	JS7
OXY	8		7	JS5
TPS	6		5	JS10
CLT	4		3	RESET (9S12C64)
AIR	2		1	BKGD (9S12C64)

5. Solder jumpers

The solder jumpers are used for the permanent selection of certain engine parameters, like the speed measurement mode, the number of ignition coils, the type of idle controller, the activation of the JAW controller etc.

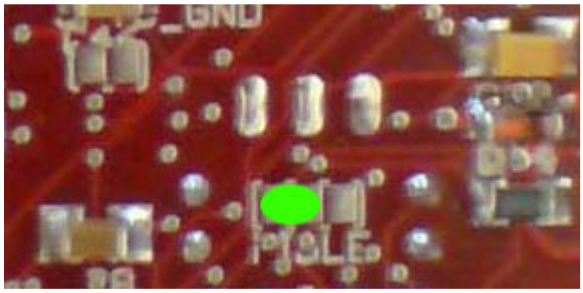
5.1 F-IDLE

2-pin idle controller:



Function: The controller opens a supplementary air supply parallel to the throttle valve/s as long as the output FDL2 is connected to ground. When the kdFi doesn't connect the output to ground any more, the spring integrated in the idle controller stops the air supply again. That is the reason for this output to be very fast pulsed (PWM) in order to hold a certain position with the corresponding pulse width.

3-pin idle controller:



Function: The same as for the 2-pin idle controller, but without spring. The
CLOSE command is also controlled by a magnetic coil. The idle controller opens, when FDL3A (Fast Idle 3-pin OPEN) switches to ground, and closes, when FDL3Z (Fast Idle 3-pin CLOSE) is activated.

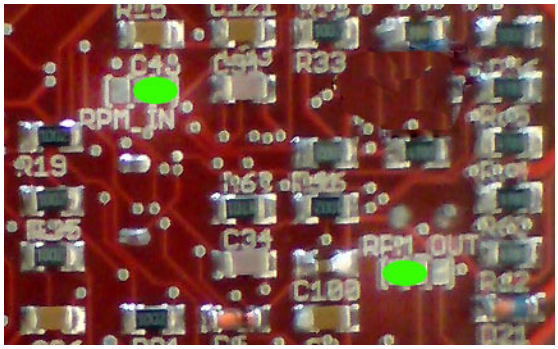
5.2 RPM_IN

The type of speed measurement is selected by the solder jumper RPM_IN.

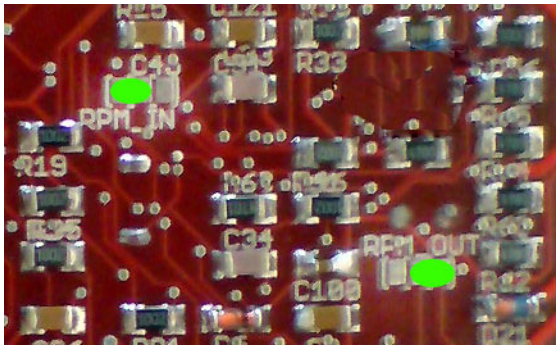
When using a VR sensor the factory settings can be retained unchanged.

When using a hall sensor the connection has to be changed – as shown on the pictures below.

VR Sensor: (Standard)



Hall Sensor:



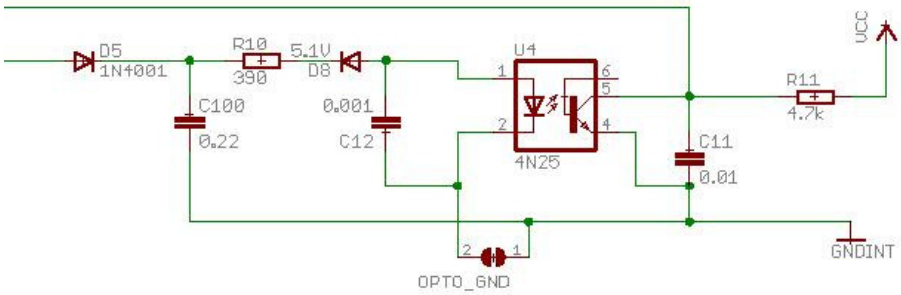
5.3 RPM_OUT

This one has to be selected according to PM_IN. See pictures 5.2

5.4 OPTO_GND

Connection to ground of the hall sensor if needed is the same as for MS V3.

Connection:



5.5 JAW

The option JAW has to be activated if the JAW wideband controller is intended to be used. This establishes a connection between the JAW output V2 and the input OXY and transmits the analog wideband signal directly.

For this you will need the accessories JAW µC and Bosch LSU 4.2.

If you select this option, any external lambda signal must not be connected to the OXY input.

5.6 R0

R0 activates the output JS11 as “Relay Output“. For this you have to connect the coil of a relay to +12V (ignition), the second contact of the coil to JS11.

The function of this output is now adjustable via Megatune “Extended” – “Output Port Settings”.

5.7 IGN_A – IGN_D

The jumper IGN_A is used for triggering the ignition output A. IGN_B to IGN_D are responsible for the ignition signals B to D accordingly. Software settings: Megatune “Basic Setup” – “Tacho input / Ignition Settings”

Examples:

Engine with mechanical distributor: Only IGN_A

1-cylinder engine: Only IGN_A

2-cylinder in-line engine with wasted spark: IGN_A with 2 power drivers

4-cylinder in-line engine with wasted spark: IGN_A, IGN_B with 2 power drivers each

6-cylinder in-line engine with wasted spark: IGN_A, IGN_B, IGN_C with 2 power drivers each

8-cylinder V engine with wasted spark: IGN_A, IGN_B, IGN_C, IGN_D with 2 power drivers each (max. equipment)

5.8 SJ201 – SJ204

Halving the series resistance of the ignition groups

If only one power driver is used per ignition output, the series resistance for the power driver can be halved. In operation, however, it turned out to be useful to always set a jumper in order to reduce the susceptibility to failure.

6. Start-up

Attention:

- The kdFi V1.3 is protected by a self-resetting thermal fuse (Polifuse). It is reset by switching off the power supply AND by cooling down at the same time.
- Take care that the TO220 housings of the power elements don't all have the same potential and so need to be isolated from the heatsink by i.e. mica washer and plastic stopper.
- **Operation of the kdFi without heatsink will cause total damage of the power elements!**

6.1 Light emitting diodes

Description	Colour	Function
RS232 A TxD	yellow	Data packet from USB to MS2
RS232 A RxD	green	Data packet from MS2 to USB
RS232 B TxD	yellow	Data packet from USB to JAW
RS232 B RxD	green	Data packet from JAW to USB
D15	blue	Depending on software (Standard: Firing pulse)
D16	blue	Depending on software (Standard: Cold advance)
D17	blue	Depending on software (Standard: Acceleration)
Knock	red	Knock identified

6.2 RPM Input

1. VR sensor

The measurement via VR sensor is the most widespread way in Europe for car engines. An AC voltage is induced in the coil of the VR sensor by a metal wheel with 60-2 or 36-1 cogs. The voltage threshold has to be set by the potentiometer **R55** and the hysteresis by the potentiometer **R54.**

These potentiometers don't have any mechanical end stop. The end can be recognized by a light, repetitive click at every rotation. In case of doubt you may make 30 counter clockwise rotations, and then the potentiometer is sure to be in zero position.

2. HALL sensor

3. Ignition coil signal

For "Fuel only" versions, where the existing ignition control should be retained, the speed signal is directly gripped at the primary side (12V) of the ignition coil.

Attention:

Never connect a measuring line to the high voltage side of the ignition coil. This will cause the complete destruction of the kdFi and can produce life-threatening situations!

6.3 Sensors

The factory settings of kdFi are adapted to Bosch sensors. If desired this can be changed by exchanging the two wired resistors **R4** and **R7** on the PCB.

Sensor	Manufacturer	Series resistance
AC Delco/GM	Daewoo, Buick, Cadillac, Chevrolet, Oldsmobile, Pontiac, GMC	**2.49k**
Ford	Ford, Lincoln, Mercury	**27k**
Bosch and Nippon Denso	Acura, Audi, BMW, Honda, Infiniti, Jaguar, Kia, Lexus, Mazda, Mitsubishi, Nissan, Suzuki, Toyota, Volkswagen, Volvo (96-up)	**2.2k (Standard)**
Mopar	Chrysler, Dodge, Plymouth	**9.31k**

6.4 Throttle potentiometer

The throttle potentiometer is connected up by a 3-wire cable. +5V and GND are connected to the outer static pins of the potentiometer. The voltage relating to the throttle position is tapped via the sliding contact and connected to the input TPS (Throttle Position Sensor).

The covered distance of the potentiometer can be longer than the rotation of the throttle axle. The corresponding calibration is done via Megatune “Tools” – “Calibrate TPS”.

6.5 Knock Input

You can employ usual knock sensors (preferentially original engine sensors). The knock frequency can be regulated via the potentiometer R88. For controlling or multiplying the setting, the control voltage relating to the adjusted knock frequency is measured at the connector JP1. The red LED D30 is used as calibration assistance. It signalises that an identified knock is transmitted to the processor input.

6.6 Digital Input

There is a digital input that can be used both for changing the engine characteristics and as “Launch Control”. The corresponding function has to be defined in Megatune. Specify JS7 as input.

6.7 Barometric Correction

For using the constant barometric correction there must be a second absolute pressure transmitter (MPX4250) at the back side that is not installed ex works.

The option “Barometric Correction” has to be activated in Megatune “Basic Settings” – “General Lags” and adjusted in “Extended” – “Barometric Correction”.

Choose JS4 as input.

6.8 Tacho Output

The output “Tacho Output” is provided for standard tachometers. It can be activated in Megatune “Extended” – “Tacho Output”. Choose “IGN (JS20)” as “Output on”.

6.9 Idle speed controller

The kdFi V1.3 supports the 2-pin as well as the 3-pin idle speed controller. The pin type of the idle controller has to be selected on the back side by the solder jumper F-IDLE (see 5.1)

Pins of the idle speed control:

2-pin: +12V and FDL2

3-pin: +12V and FDL3A (open) and FDL3Z (closed)

6.10 Ignition

The ignition coil can be activated directly by the power drivers integrated in the kdFi V1.3. We recommend using a shielded multi-conductor cable for connection. The kdFi can be extended to up to 8 power drivers enabling direct activation of 8 ignition coils according to the wasted spark principle.

Alternatively ignition modules such as EDIS or Bosch can be used as well. Therefore the triggering signal can be tapped from the solder jumper IGN_A to IGN_D.

6.11 Injection

There are two outputs (INJ1, INJ2) for injection groups. The additional ground connection between the outputs should be connected to ground with low resistance (with large conductor cross-section) in order to avoid potential shifts on the PCB. The injection valves are supplied with +12V via the ignition, the ground wires of the valves are activated via the control unit.

Attention: The setting whether the injection valves are of high or of low resistance has to be entered in Megatune “Basic Settings” – “Injector Characteristics” in any case prior to the first test run. False settings can cause destruction of the injection valves or of the kdFi.

6.12 Relay Output

See 5.6 R0

6.13 Boost control

The boost pressure is controlled by means of a fast acting valve at the Waste Gate. In MSextra this part of the software is described as “EXPERIMENTAL – use with care”. For further information please refer to actual details on the internet.

6.14 JAW

(Just Another Wideband from Alan To - www.14point7.com)

The JAW circuit was integrated in the kdFi V1.3 for obtaining a space-saving, advantageous solution. By retrofitting the socketed Jaw processor, a wideband lambda controller is available at once. Its analog output “V2” can be connected to the “OXY” input of the kdFi by the solder jumper “JAW” on the back side of the PCB.

JAW can be activated and configured by the JAW Deploy software and the second serial port installed after the connection of the kdFi.

6.15 CAN Bus

Like for the Megasquirt 2 the CAN Bus is prepared concerning the hardware, but has to be programmed by the user if desired. For further information on this item please read the respective Megasquirt /MSextra websides on the internet.

7. Firmware updates

As usual for MSextra the firmware updates are performed **without** setting a boot jumper. You have to start the program “Download-Firmware” from the Megasquirt folder of your Windows starting menu and to select the same COM port as in Megatune.

Megatune has to be closed during the firmware updates to avoid access troubles.

Disconnect the ignition coils in any case during the firmware update; otherwise this could cause destruction of the power driver as well as of the ignition coils!

8. Notes